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Green and Sustainable Advanced Materials Handbook of Greener Synthesis of Nanomaterials and Compounds Vegetable Fiber Composites and Their Technological Applications MXenes and their Composites Green Synthesis of Nanomaterials Green Synthesis, Characterization and Applications of Nanoparticles Applications of Nanotechnology for Green Synthesis Cadmium based II-VI Semiconductor Nanomaterials Green synthesis of copper and zinc nanoparticles from plant extracts and evaluation of their antifungal activity against Fusarium oxysporum cubense: an overview Nanostructures Quantum Dots Green Synthesis of Nanoparticles Applications and Prospects Biosynthesized Nanomaterials Silver Nanoparticles Synthesis of Inorganic Nanomaterials Green Processes for Nanotechnology Optical and Molecular Physics Green Approaches in Medicinal Chemistry for Sustainable Drug Design Environmental Nanotechnology Nanomaterials and Nanocomposites Green synthesis of copper and zinc nanoparticles using different varieties of banana starch, latex and sap and evaluation of their antifungal activity against Fusarium oxysporum cubense Sustainable Nanocellulose and Nanohydrosols from Natural Sources Green Nanomaterials Polymer Science and Innovative Applications Green Synthesis of Nanomaterials for Bioenergy Applications Nanostructures for Antimicrobial Therapy Nanomaterials and Green Synthesis of Silver Nanomaterials Spinels Nanoferrites Green Nanomaterials for Industrial Applications Advances in Green Synthesis Green Polymeric Nanocomposites Microbial Nanotechnology Nanoparticles Green Metal Nanoparticles Green Photo-active Nanomaterials Titanium Dioxide (TiO2) and Its Applications Green Electrosprinning Synthesis Techniques for Polymer Nanocomposites Green Synthesis in Nanomedicine and Human Health

Green and Sustainable Advanced Materials Nanostructures for Antimicrobial Therapy discusses the pros and cons of the use of nanostructured materials in the prevention and eradication of infections, highlighting the efficient microbicidal effect of nanoparticles against antibiotic-resistant pathogens and biofilms. Conventional antibiotics are becoming ineffective towards microorganisms due to their widespread and often inappropriate use. As a result, the development of antibiotic resistance in microorganisms is increasingly being reported. New approaches are needed to confront the rising issues related to infectious diseases. The merging of biomaterials, such as chitosan, carrageenan, gelatin, poly (lactic-co-glycolic acid) with nanotechnology provides a promising platform for antimicrobial therapy as it provides a controlled way to target cells and induce the desired response without the adverse effects common to many traditional treatments. Nanoparticles represent one of the most promising therapeutic approaches to the problem caused by infectious microorganisms resistant to traditional therapies. This volume discusses this promise in detail, and also discusses what challenges the greater use of nanoparticles might pose to medical professionals. The unique physiochemical properties of nanoparticles, combined with their growth inhibitory capacity against microbes has led to the uptake in the research on nanoparticles as antimicrobials. The importance of bactericidal nanobiomaterials study will likely increase as development of resistant strains of bacteria against most potent antibiotics continues. Shows how nanoantibiotics can be used to more effectively treat disease Discusses the advantages and issues of a variety of different nanoantibiotics, enabling medics to select which best meets their needs Provides a cogent summary of recent developments in this field, allowing readers to quickly familiarize themselves with this topic area

Handbook of Greener Synthesis of Nanomaterials and Compounds Sustainable development is a very prevalent concept of modern society. This concept has appeared as a critical force in combining a special focus on development and growth by maintaining a balance of using human resources and the ecosystem in which we are living. The development of new and advanced materials is one of the powerful examples in establishing this concept. Green and sustainable advanced materials are the newly synthesized material or existing modified material having superior and special properties. These fulfill today's growing demand for equipment, machines and devices with better quality for an extensive range of applications in various sectors such as paper, biomedical, textile, and much more. Volume 1 gives overviews on a variety of topics of characterization of green and sustainable advanced materials including biopolymers, biocomposites, nanomaterials, polymeric materials, green functional textiles materials and hybrid materials, as well as processing chapters on the design and process aspects of nanofabrication.

Vegetable Fiber Composites and Their Technological Applications Covering fundamentals through applications, this book discusses environmentally friendly polymer nanocomposites and alternatives to traditional nanocomposites through detailed reviews of a variety of materials procured from different resources, their synthesis, and applications using alternative green approaches. The text: Describes green polymeric nanocomposites that show greater properties in terms of degradability, biocompatibility, synthesis process, cost effectiveness, mechanical strength, high surface area, nontoxicity, and environmental friendliness Explains the basics of eco-friendly polymer nanocomposites from different natural resources and their chemistry Discusses practical applications that present future directions in the biomedical, pharmaceutical, and automotive industries This book is aimed at scientists, researchers, and academics working in nanotechnology, biomaterials, polymer science, and those studying products derived from eco-friendly nanomaterials.

MXenes and their Composites Nanotechnology is the application of science to control matter at the molecular level. It has become one of the most promising applied technologies in all areas of science. Nanoparticles have multi-functional properties and have created very interesting applications in various fields such as medicine, nutrition, bioenergy, agriculture and the environment. But the biogenic syntheses of monodispersed nanomaterials with specific sizes and shapes have been a challenge in biomaterial science. Nanoparticles are of great interest due to their extremely small size and large surface-to-volume ratio, which lead to both chemical and physical differences in their properties (e.g., mechanical properties, biological and surface properties, catalytic activity, thermal and electrical conductivity, optical absorption and melting point) as compared to bulk of the same chemical composition. Recently, however, synthesizing novel nanoparticles using green technology via microorganisms, plants, viruses, and so on, has been extensively studied and has become recognized as a green and efficient way for further exploiting biological systems as convenient nanofactories. Thus the biological synthesis of nanoparticles is increasingly regarded as a rapid, ecofriendly, and easily scalable-up technology. Today researchers are developing new techniques and materials using nanotechnology that may be suitable for plants to boost their native functions. Recently, biological nanoparticles were found to be more pharmacologically active than physico-chemically synthesized nanoparticles. Various applications of biosynthesized nanoparticles have been discovered, especially in the field of biomedical research, such as applications to specific delivery of drugs, use for tumor detection, angiogenesis, genetic disease and genetic disorder diagnosis, photoimaging, and photothermal therapy. Further, iron oxide nanoparticles have been applied to cancer therapy,
hyperthermia, drug delivery, tissue repair, cell labeling, targeting and immunoassays, detoxification of biological fluids, magnetic resonance imaging, and magnetically responsive drug delivery therapy. Nanoparticle synthesis for plant byproducts for biomedical applications has vast potential. This book offers researchers in plant science and biomedicine the latest research and opportunity to develop new tools for the synthesis of environmentally friendly and cost-effective nanoparticles for applications in biomedicine as well as other various fields.

Green Synthesis of Nanomaterials This edited book focusses on green chemistry as the research community endeavours to create eco-friendly materials and technologies. It provides an in-depth overview of the fundamentals, key concepts and experimental techniques for eco-friendly synthesis of organic compounds and metal/metal oxide nanoparticles/hanomaterials. It also emphasizes the mechanisms, designing and industrial technologies for green synthesis and its applications. Each chapter brings the recent developments, state of the art, challenges and perspectives which cover all the aspects in one place, and which concern the green synthesis and evolution. Authored by world-renowned experts in a broad range of green chemistry sectors, this book is an archival reference guide for researchers, engineers, scientists and postgraduates working in the field of sustainable science, green chemistry, environmental science, engineering sciences and industrial technologies.

Green Synthesis, Characterization and Applications of Nanoparticles Synthesis of Inorganic Nanomaterials: Advances and Key Technologies discusses the latest advancements in the synthesis of various types of nanomaterials. The book’s main objective is to provide a comprehensive review regarding the latest advances in synthesis protocols that includes up-to-date data records on the synthesis of all kinds of inorganic nanostructures using various physical and chemical methods. The synthesis of all important nanomaterials, such as carbon nanostructures, Core-shell Quantum dots, Metal and metal oxide nanostructures, Nanoferrites, polymer nanostructures, nanofibers, and smart nanomaterials are discussed, making this a one-stop reference resource on research accomplishments in this area. Leading researchers from industry, academia, government and private research institutions across the globe have contributed to the book. Academics, researchers, scientists, engineers and students working in the field of polymer nanocomposites will benefit from its solutions for material problems. Provides an up-to-date data record on the synthesis of all kinds of organic and inorganic nanostructures using various physical and chemical methods. Presents the latest advances in synthesis protocols Includes the latest techniques used in the physical and chemical characterization of nanomaterials Covers the characterization of all the important materials groups, such as carbon nanostructures, core-shell quantum dots, metal and metal oxide nanostructures, Nano ferrites, polymer nanostructures and nanofibers

Applications of Nanotechnology for Green Synthesis CAC series highlights new advances in the field. This Volume 94 presents interesting chapters on the recent advances in the role of nanoparticles in plant biotechnology. Each chapter is written by international experts in the respective fields. Provides the authority and expertise of leading contributors from an international board of authors. Presents the latest release in the Comprehensive Analytical Chemistry series Updated release includes the latest information on Biosynthesized nanomaterials

Cadmium based II-VI Semiconducting Nanomaterials Providing up-to-date coverage of green nanomaterials and systems, this book provides comprehensive information on nanostructured materials, including their applications in energy and environmental sciences. The book focusses on photo-active nanostructured materials, from the basic understanding of solar energy activation to their sustainable preparation and applications in environmental remediation and fuel production from biomass and carbon dioxide. It also examines the health and environmental impacts of photo-catalyst nanomaterials. This book is an important reference for researchers and industrial chemists working in the fields of energy and environmental remediation.

Green synthesis of copper and zinc nanoparticles from plant extracts and evaluation of their antifungal activity against Fusarium oxysporum cubense: an overview Traditional methods in synthetic chemistry produce chemical waste and byproducts, yield smaller desired products, and generate toxic chemical substances, but the past two centuries have seen consistent, greener improvements in organic synthesis and transformations. These improvements have contributed to substance handling efficiency by using green-engineered forerunners like sustainable techniques, green processes, eco-friendly catalysis, and have minimized energy consumption, reduced potential waste, improved desired product yields, and avoided toxic organic precursors or solvents in organic synthesis. Green synthesis has the potential to have a major ecological and monetary impact on modern pharmaceutical R&D and organic chemistry fields. This book presents a broad scope of green techniques for medicinal, analytical, environmental, and organic chemistry applications. It presents an accessible overview of new innovations in the field, dissecting the highlights and green chemistry attributes of approaches to green synthesis, and provides cases to exhibit applications to pharmaceutical and organic chemistry. Although daily chemical processes are a major part of the sustainable development of pharmaceutical and industrial products, the resulting environmental pollution of these processes is of worldwide concern. This edition discusses green chemistry techniques and sustainable processes involved in synthetic organic chemistry, natural products, drug syntheses, as well various useful industrial applications.

Nanowires Scientific interest in TiO2-based materials has exponentially grown in the last few decades. Titanium Dioxide (TiO2) and Its Applications introduces the main physicochemical properties of TiO2 which are the basis of its applications in various fields. While the basic principles of the TiO2 properties have been the subject of various previous publications, this book is mainly devoted to TiO2 applications. The book includes contributions written by experts from a wide range of disciplines in order to address titanium dioxide’s utilization in energy, consumer, materials, devices, and catalytic applications. The various applications identified include: photocatalysis, catalysis, optics, electronics, energy storage and production, ceramics, pigments, cosmetics, sensors, and heat transfer. Titanium Dioxide (TiO2) and Its Applications is suitable for a wide readership in the disciplines of materials science, chemistry, and engineering in both academia and industry. Includes a wide range of current and emerging applications of titanium dioxide in the fields of energy, consumer applications, materials, and devices Provides a brief overview of titanium dioxide and its properties, as well as techniques to design, deposit, and study the material Discusses the relevant properties, preparation methods, and other alternative considerations in each application-focused chapter

Quantum Dots Zinc Oxide (ZnO) is a metal oxide semiconductor of group II-IV whose nature resides at the borderline between covalent and ionic semiconductors. In the last decade it has raised several attention in the research field since it possesses promising catalytic, electrical, electronic and optical properties. It can be easily prepared in different shapes and sizes at both the micrometric and nanometric scale, including the forms of micro- and nanowires, nanobelts, nanotubes, micro- and nanoparticles, multipods, tetrapods, and flower-like microstructures. This
different variety of morphologies has thus attracted considerable attention for potential application in solar cells, nanogenerators, field effect transistors, gas sensors and other electronic micro- and nanodevices. This book discusses the synthesis and the electrical properties of ZnO nanowires. It also discusses rough silver nanowires, nanobuds and nanoparticle substrates; the synthesis and properties of Ni nanowires in porous silicon templates; and phonon scattering and elastic energy propagation in nanowires.

Green Synthesis of Nanoparticles: Applications and Prospects Nanomaterials possess astonishing physical and chemical properties. They play a key role in the development of novel and effective drugs, catalysts, sensors, and pesticides, to cite just a few examples. Notably, the synthesis of nanomaterials is usually achieved with chemical and physical methods needing the use of extremely toxic chemicals or high-energy inputs. To move towards more eco-friendly processes, researchers have recently focused on so-called "green synthesis", where microbial, animal-, and plant-borne compounds can be used as cheap reducing and stabilizing agents to fabricate nanomaterials. Green synthesis routes are cheap, environmentally sustainable, and can lead to the fabrication of nano-objects with controlled sizes and shapes—two key features determining their bioactivity. However, real-world applications of green-fabricated nanomaterials are largely unexplored. Besides, what do we really know about their non-target toxicity? Which are their main modes of action? What is their possible fate in the environment? In this framework, the present Special Issue will include articles by expert authorities on nanomaterials synthesis and applications. Special emphasis will be placed on their impact on the environment and long-term toxicity.

Biosynthesized Nanomaterials The use of biological sources such as microbes and plants can help in synthesizing nanoparticles in a reliable and eco-friendly way. The synthesis of nanoparticles by these natural sources is characterized by processes that take place near to ambient temperature and pressures and also near neutral pH. This edited volume authored by subject specialists, provides all the latest research and builds a database of bioreduction agents to various metal nanoparticles using different precursor systems. The book also highlights the different strategies such as simplicity, cost-effectiveness, environment-friendly and easily scalable, and includes parameters for controlling the size and shape of the materials developed from the various greener methods. In order to exploit the utmost potential metal nanoparticles synthesis from the different sources such as agricultural waste, flora and fauna, food waste, microbes and biopolymer systems, it is also crucial to recognize the biochemical and molecular mechanisms of production of nanoparticles and their characterization.

Silver Micro-Nanoparticles Green Synthesis, Characterization and Applications of Nanoparticles shows how eco-friendly nanoparticles are engineered and used. In particular, metal nanoparticles, metal oxide nanoparticles and other categories of nanoparticles are discussed. The book outlines a range of methodologies and explores the appropriate use of each. Characterization methods include spectroscopic, microscopic and diffraction methods, but magnetic resonance methods are also included as they can be used to understand the mechanism of nanoparticle synthesis using organisms. Applications covered include targeted drug delivery, water purification and hydrogen generation. This is an important research resource for those wishing to learn more about how eco-efficient nanoparticles can best be used. Theoretical details and mathematical derivations are kept to a necessary minimum to suit the need of interdisciplinary audiences and those who may be relatively new to the field. Explores recent trends in growth, characterization, properties and applications of nanoparticles Gives readers an understanding on how they are applied through the use of case studies and examples Assesses the advantages and disadvantages of a variety of synthesis and characterization techniques for green nanoparticles in different situations

Synthesis of Inorganic Nanomaterials Polymer Science and Innovative Applications: Materials, Techniques, and Future Developments introduces the science of innovative polymers and composites, their analysis via experimental techniques and simulation, and their utilization in a variety of application areas. This approach helps to unlock the potential of new materials for product design and other uses. The book also examines the role that these applications play in the human world, from pollution and health impacts, to their potential to make a positive contribution in areas including environmental remediation, medicine and healthcare, and renewable energy. Advantages, disadvantages, possibilities, and challenges relating to the utilization of polymers in human society are included. Presents the latest advanced applications of polymers and their composites and identifies key areas for future development Introduces the simulation methods and experimental techniques involved in the modification of polymer properties, supported by clear and detailed images and diagrams Supports an interdisciplinary approach, enabling readers across different fields to harness the power of new materials for innovative applications.

Green Processes for Nanotechnology The main aims of this book are to summarize the fundamentals, synthesis methods, properties and applications of nanomaterials, so as to provide readers with a systematic knowledge on nanomaterials. In addition, the book covers most commonly used characterization tools pertaining to nanomaterials. Further, it deals with relevant aspects of nanocomposites which contains dispersion of nano-sized particulates, and carbon nanotubes (CNTs) in the matrices (polymer, metal and ceramic). It also discusses development of smart nano textiles (intelligent textiles), self-cleaning glass, sensors, actuators, ferro-fluids, and wear resistant nano coatings. Aimed at senior undergraduate and graduate students, the key features on this book include: Top-down and bottom-up approaches for the synthesis of nanomaterials included Illustrates sample preparation and basic principle of characterization tools for nanomaterials Explains calculation of ratios of surface area to volume and surface atoms to bulk atoms Reviews synthesis, properties and applications of carbon nanotubes and magnetic nanomaterials Discusses size effect on thermal, mechanical, optical, magnetic and electrical properties

Optical and Molecular Physics This book describes the different methodologies for producing and synthesizing silver nanoparticles (AgNPs) of various shapes and sizes. It also provides an in-depth understanding of the new methods for characterizing and modifying the properties of AgNPs as well as their properties and applications in various fields. This book is a useful resource for a wide range of readers, including scientists, engineers, doctoral and postdoctoral fellows, and scientific professionals working in specialized fields such as medicine, nanotechnology, spectroscopy, analytical chemistry diagnostics, and plasmonics.

Green Approaches in Medicinal Chemistry for Sustainable Drug Design The book provides a thorough survey of current research in quantum dots synthesis, properties, and applications. The unique properties of these new nanomaterials offer multifunctional applications in such fields as photovoltaics, light-emitting diodes, field-effect transistors, lasers, photodetectors, solar cells, biomedical diagnostics and quantum computing. Keywords: Quantum Dots (QD), Photovoltaics, Light-emitting Diodes, Field-effect Transistors, Lasers, Photodetectors, Solar Cells, Biomedical Diagnostics, Quantum Computing, QD Synthesis, Carbon QDs, Graphene QDs, QD Sensors, Supercapacitors, Magnetic Quantum Dots,
Environmental Nanotechnology Nanomaterials: Application in Biofuels and Bioenergy Production Systems looks at how biofuels and bioenergy can be part of the "sustainable" solution to the world's energy problems. By addressing bioenergy products compared to their fossil energy counterparts, covering research and development in biofuels applied with nanomaterials this book analyzes the future trends and how biofuels and bioenergy can contribute to its optimization. Starting from fundamentals up to synthesis, characterization and applications of nanomaterials in biofuels and bioenergy production systems, the chapters include the procedures needed for introducing nanomaterials in these specific sectors along with the benefits derived from their applications. Including the hazards and environmental effects of nanomaterials in bioenergy applications, sustainability issues and a techno-economic analysis of the topic, this book provides researchers in bioscience, energy & environment and bioengineering with an up to date look at the full life cycle assessment of nanomaterials in bioenergy. Provides a one stop solution manual for applications of nanomaterials in bioenergy and biofuels Includes biofuel applications with compatible global application case studies Addresses the demand for environmental and techno-economic analysis of nanomaterials applications

Green synthesis of copper and zinc nanoparticles using different varieties of banana starch, latex and sap and evaluation of their antifungal activity against Fusarium oxysporum cubense Sustainable Nanocellulose and Nanohydrogels from Natural Sources explores the use of biopolymers in specific application areas such as electronics, energy, consumer goods, packaging materials, therapeutics, water treatment and engineering, and what makes the particular polymer to engage it in these applications. This is an important reference source for those who would like to learn more about how biopolymeric nanocomposites are used in sustainability and environmental protection. Biopolymers, including plant and sea-based polymers, play an important role in the formation and maintaining the stability of industrial nanocomposites; their common functions being the surface modification and protection for the highly oxidative-unstable cores, as stable base for holding multiple targets, and as a shield for the inorganic and highly toxic metals. These biopolymer-based nanocomposites are being used for applications in the electronics, automobile, construction and biomedical sectors. Explains the major design and development techniques of novel biopolymer-based nanocomposites Demonstrates how Nanocelluloses and Nanohydrogels are being used for environmental health and safety Explores how biopolymer-infused nanocellulose and nanogels are less toxic than their conventional counterparts

Sustainable Nanocellulose and Nanohydrogels from Natural Sources Optica and Molecular Physics: Theoretical Principles and Experimental Methods addresses many important applications and advances in the field. This book is divided into 5 sections: Plasmonics and carbon dots physics with applications Optical films, fibers, and materials Optical properties of advanced materials Molecular physics and diffusion Macromolecular physics Weaving together science and engineering, this new volume addresses important applications and advances in optical and molecular physics. It covers plasmonics and carbon dots physics with applications; optical films, fibers, and materials; optical properties of advanced materials; molecular physics and diffusion; and macromolecular physics. This book looks at optical materials in the development of composite materials for the functionalization of glass, ceramic, and polymeric substrates to interact with electromagnetic radiation and presents state-of-the-art research in preparation methods, optical characterization, and usage of optical materials and devices in various photonic fields. The authors discuss devices and technologies used by the electronics, magnets, and photonics industries and offer perspectives on the manufacturing technologies used in device fabrication.

Green Nanomaterials An authoritative summary of the quest for an environmentally sustainable synthesis process of nanomaterials and their application for environmental sustainability Green Synthesis of Nanomaterials for Bioenergy Applications is an important guide that provides information on the fabrication of nanomaterial and the application of low cost, green methods. The book also explores the impact on various existing bioenergy approaches. Throughout the book, the contributors—noted experts on the topic—offer a reliable summary of the quest for an environmentally sustainable synthesis process of nanomaterials and their application to the field of environmental sustainability. The green synthesis of nanoparticles process has been widely accepted as a promising technique that can be applied to a variety of fields. The green nanotechnology-based production processes to fabricate nanomaterials operates under green conditions without the intervention of toxic chemicals. The book’s exploration of more reliable and sustainable processes for the synthesis of nanomaterials, can lead to the commercial application of the economically viability of low-cost biofuels production. This important book: Summarizes the quest for an environmentally sustainable synthesis process of nanomaterials for their application to the field of environmental sustainability Offers an alternate, sustainable green energy approach that can be commercially implemented worldwide Covers recent approaches such as fabrication of nanomaterial that apply low cost, green methods and examines its impact on various existing bioenergy applications Written for researchers, academics and students of nanotechnology, nanosciences, bioenergy, material science, environmental sciences, and pollution control, Green Synthesis of
Nanomaterials for Bioenergy Applications is a must-have guide that covers green synthesis and characterization of nanomaterials for cost effective bioenergy applications.

Polymer Science and Innovative Applications This book provides technological perspective and comprehensive overview on the research efforts related to II-VI group cadmium based semiconducting nanomaterials. It describes state-of-the-art information on different synthesis methods for preparation of these materials using a variety of experimental strategies. The effects of synthesis roots on structural, thermal, mechanical, lattice vibronic, electronic, optical and carrier transport characteristics of these nano-structures are systematically analyzed. A wide target readership comprising of students, researchers, scholars, scientists, technicians, academicians, industrialists can benefit from this book, as cadmium based semiconductors possess significant research and industrial interest thanks to their innovative properties.

Green Synthesis of Nanomaterials for Bioenergy Applications This book introduces the principles and mechanisms of the biological synthesis of nanoparticles from microorganisms, including bacteria, fungi, viruses, algae, and protozoans. It presents optimization processes for synthesis of microbes-mediated nanoparticles. The book also reviews the industrial and agricultural applications of microbially-synthesized nanoparticles. It also presents the medical applications of green nanoparticles, such as treating multirad-drug-resistant pathogens and cancer treatment. Further, it examines the advantages and prospects for the synthesis of nanoparticles by microorganisms. Lastly, it also presents the utilization of microbial-synthesized nanoparticles in the bioremediation of heavy metals.

Nanostructures for Antimicrobial Therapy This book describes various strategies for the synthesis of green nanoparticles using plant extracts and microbes, including the advantages and disadvantages of different methods and their applications. After discussing strategies for and the potential of green synthesis of noble metal nanoparticles, it highlights the role of the solvent system. The book then explores the stability/toxicity of nanoparticles and the associated-surface engineering techniques for achieving biocompatibility, and examines the antimicrobial efficacy of green nanoparticles with regard to various bacterial pathogens, as well as the underlying cytotoxicity mechanisms. Lastly, the book addresses the potential applications of various green nanoparticles in cancer theranostics, and reviews a number of plant-mediated nanoparticles as potential pharmaceutical agents. Given its scope, the book will be of interest to all scientists and students wanting to learn more about the synthesis and applications of green nanoparticles.

Nanomaterials Extensive experimentation and high failure rates are a well-recognised downside to the drug discovery process, with the resultant high levels of inefficiency and waste producing a negative environmental impact. Sustainable and Green Approaches in Medicinal Chemistry reveals how medicinal and green chemistry can work together to directly address this issue. After providing essential context to the growth of green chemistry in relation to drug discovery in Part 1, the book goes on to identify a broad range of practical methods and synthesis techniques in Part 2. Part 3 reveals how medicinal chemistry techniques can be used to improve efficiency, mitigate failure and increase the environmental benignity of the entire drug discovery process, whilst Parts 4 and 5 discuss natural products and microwave-induced chemistry. Finally, the role of computers in drug discovery is explored in Part 6. Identifies novel and cost effective green medicinal chemistry approaches for improved efficiency and sustainability Reflects on techniques for a broad range of compounds and materials Highlights sustainable and green chemistry pathways for molecular synthesis

Green Synthesis of Silver Nanomaterials Modern techniques to produce nanoparticles, nanomaterials, and nanocomposites are based on approaches that frequently involve high costs, inefficiencies, and negative environmental impacts. As such, there has been a real drive to develop and apply approaches that are more efficient and benign. The Handbook of Greener Synthesis of Nanomaterials and Compounds provides a comprehensive review of developments in this field, combining foundational green and nano-chemistry with the key information researchers need to assess, select and apply the most appropriate green synthesis approaches to their own work. Volume 2: Synthesis at the Macroscale and Nanoscale explores synthesis at different scales. Beginning with a selection of chapters discussing a range of macroscale topics, the book goes on to explore such important areas as metal nanoparticle synthesis, biogenic synthesis, and synthesis of enzymes. Further chapters explore the role of Metal Organic Frameworks in greener synthesis, synthesis from renewable sources, and impacts of nanomaterials synthesized by greener methods. Discusses the synthesis of widely different groups of chemical compounds and distinct materials Reviews synthesis at both the macro and nanoscales, including information on metal-organic frameworks, carbon dots and ionic liquids Provides examples of applications to support learning and guide implementation of theory in practice

Spinel Nanoferrites This book comprises a collection of chapters on advances in green nanomaterials. The book looks at ways to establish long-term safe and sustainable forms of nanotechnolog through implementation of nanoparticle biosynthesis with minimum impact on the ecosystem. The book looks at synthesis, processing, and applications of metal and metal oxide nanomaterials and also at bio-nanomaterials. The contents of this book will prove useful for researchers and professionals working in the field of nanomaterials and green technology.

Green Nanomaterials for Industrial Applications The last two decades have seen electrospinning of nanofibers performed mainly from solutions of toxic organic solvents. The increase in demand for scaling up electrospinning in recent years therefore requires an environmentally friendly process free of organic solvents. This book addresses techniques for clean and safe electrospinning in the fabrication of green nanofibers and their potential applications.

Advances in Green Synthesis The book series 'Polymer Nano-, Micro- and Macrocomposites' provides complete and comprehensive information on all important aspects of polymer composite research and development, including, but not limited to synthesis, filler modification, modeling, characterization as well as application and commercialization issues. Each book focuses on a particular topic and gives a balanced in-depth overview of the respective subfield of polymer composite science and its relation to industrial applications. With the books the readers obtain dedicated resources with information relevant to their research, thereby helping to save time and money. Summarizing all the most important synthesis techniques used in the lab as well as in industry, this book is comprehensive in its coverage from chemical, physical and mechanical viewpoints. This book helps readers to choose the correct synthesis route, such as suspension and miniemulsion polymerization, living polymerization, sonication, mechanical methods or the use of radiation, and so achieve the desired composite properties.
Green Polymeric Nanocomposites This book provides the state-of-the-art survey of green techniques in preparation of different classes of nanomaterials, with an emphasis on the use of renewable sources. Key topics covered include fabrication of nanomaterials using green techniques as well as their properties and applications, the use of renewable sources to obtain nanomaterials of different classes, from simple metal and metal oxide nanoparticles to complex bioinspired nanomaterials, economic contributions of nanotechnology to green and sustainable growth, and more. This is an ideal book for students, lecturers, researchers and engineers dealing with versatile (mainly chemical, biological, and medical) aspects of nanotechnology, including fabrication of nanomaterials using green techniques and their properties and applications.

Microbial Nanotechnology Green Synthesis of Silver Nanomaterials illustrates how to biologically scale up silver nanoparticle synthesis. This book covers green synthesis of silver nanomaterials, via plants, agricultural waste, fungi, and microorganisms. Sections cover the synthesis and characterization of chemical and green synthesis, various types of silver nanomaterialism, the ability of different fungal species, such as filamentous fungi, to produce silver nanoparticles, the microbial synthesis of silver NMs, biosynthesis mechanisms, toxicity, fate and commercialization. As examples, greener pathways and mechanisms, toxicity of silver nanoparticles in aquatic life and in natural eco-systems, and strategies for the scaling up of green-synthesized nanomaterials are discussed. With the extended work in enhancing nanomaterials synthesis performance, and discovering their biomedical, environmental, and agricultural applications, it is hoped that the execution of these methods on a large scale and their industrial applications in different fields will take place in the near future. Assesses the impact of a large variety of silver-based nanostructures in the biomedical, environmental and agri-food sectors Discusses the major synthesis methods used for effectively processing plant-based silver nanoparticles Outlines the potential and major challenges for adopting green synthesis methods on a mass scale.

Green Nanoparticles This book highlights the complexity of spinel nanoferites, their synthesis, physio-chemical properties and prospective applications in the area of advanced electronics, microwave devices, biotechnology as well as biomedical sciences. It presents an overview of spinel nanoferites: synthesis, properties and applications for a wide audience: from beginners and graduate-level students up to advanced specialists in both academic and industrial sectors. There are 15 chapters organized into four main sections. The first section of the book introduces the readers to spinel ferrites and their applications in advanced electronics industry including microwave devices, whereas the second section mainly focus on the synthesis strategy and their physico-chemical properties. The last sections of the book highlight the importance of this class of nanomaterials in the field of biotechnology and biomedical sector with a special chapter on water purification.

Green Metal Nanoparticles Soil borne diseases which are caused to various plants include a wide variety of soil microbes like fungi and bacteria, among which Fusarium wilt is one such disease caused by Fusarium oxysporum cubense in banana plants. Wilt disease or the banana disease of plant is among the most destructive disease of banana in the tropics and even the control methods like field sanitation, soil treatments and crop rotations have not been a long term control for this disease. An alternative method of treating Fusarium oxysporum was adopted by using various banana plants mainly its peel, pulp sap and its latex of varieties such as Robusta (B1) Musa acuminate Colla (AAA), Etha (B2) Musa x paradisiaca (AAB), Poovan (B3) Musa x paradisiaca (AAB), Sundari (B4) Musa acuminate Colla (AA), Njaliemploovan (B5) Musa acuminate Colla (AB), Palayamkodan (B6) Musa x paradisiaca (AAB), Kannan (B8) Musa acuminate Colla (AAA), Pachakadali (B9) Musa acuminate Colla (AAA). Nanoparticles are small particles with a dimension of 10-9 and 10-10. Green synthesis is a new method developed for the synthesis of nanoparticles which is small in size, large surface area and eco-friendly. Leaf extracts of these plants were used for synthesis of copper and zinc nanoparticles, as nanoparticles are powerful antimicrobial agents. The results shows that dry skin and fruit extracts of Palamkodan, Njaliemploovan, Etha, Pachakadali with solvents, propane, ethanol, methanol and acetone and the fresh extract latex and sap of Palamkodan and Poovan with solvents isoproponol, ethanol, methanol with 1/10 and 1/50 dilution are used for the synthesis of copper and zinc nanoparticles. Copper and zinc nanoparticles shows greater antifungal activity than copper sulphate and zinc sulphate, respectively and dry extract. The maximum zone of inhibition was at 50 and 100 µl for all the test plates. This indicates that the zone of inhibition increases with as the concentration of nanoparticles increased. An overall result showed that ethanol, methanol and isopropanol could be used as a good solvents and skin of Njaliemploovan and Etha could be used for controlling the Fusarium oxysporum cubense under invitro conditions.

Green Photo-active Nanomaterials Soil borne diseases which are caused to various plants include a wide variety of soil microbes like fungi and bacteria, among which Fusarium wilt is one such disease caused by Fusarium oxysporum cubense in banana plants. Wilt disease or the banana disease of plant is among the most destructive disease of banana in the tropics and even the control methods like field sanitation, soil treatments and crop rotations have not been a long term control for this disease. An alternative method of treating Fusarium oxysporum was adopted by using various natural plant leaves of Chromolaena odorata, Justicia adhatoda, Glycosmis pentaphylla, Azadirachta indica, Gliricidia sepium, Piper nigrum, Ocimum tenuiflorum and Tabernaemontana divaricate. Nanoparticles are small particles with a dimension of 10-9 and 10-10. Green synthesis is a new method developed for the synthesis of nanomaterials which is small in size, large surface area and eco-friendly. Leaf extracts of these plants were used for synthesis of copper and zinc nanoparticles, as nanoparticles are powerful antimicrobial agents. The extract is prepared with a stock solution of 100mM copper sulphate and 100mM zinc sulphate. The leaf extracts were prepared with 5 solvents (Distilled water, Propane, Hexane, Acetone and Methanol). The action of plant leaves were observed by the zone of inhibition obtained with a concentration of 50, 100 and 150µl respectively. The result was more in copper nanoparticles of leaf extract as compared to the zinc nanoparticles of particular leaf extracts but the zinc particles with methanol and propane showed good result with particular leaves. In dried condition of leaves copper nanoparticles with propane as solvent exhibited a greater zone of inhibition. Moreover the solvent, methanol showed good results with both zinc and copper nanoparticles. The synthesized nanoparticle was characterized by UV-VIS spectrophotometry to confirm the formation of nanoparticles. Green synthesis is used namely because of low cost, simple, use of less toxic materials, most important is eco-friendly.

Titanium Dioxide (TiO2) and Its Applications This book explores vegetable fiber composite as an eco-friendly, biodegradable, and sustainable material that has many potential industrial applications. The use of vegetable fiber composite supports the sustainable development goals (SDGs) to utilize more sustainable and greener composite materials, which are also easy to handle and locally easily available with economical production costs. This book presents various types of vegetable fiber composite and its processing methods and treatments to obtain desirable properties for certain applications. The book caters to researchers and students who are working in the field of bio-composites and green materials.
Green Electrospinning This is the second volume on Environmental Nanotechnology. The first chapter discusses the synthesis of nanomaterial and mainly the green synthesis of inorganic nanomaterials. Furthermore, a comparative discussion about resistive and capacitive measurement of nano-based biosensor is reviewed and the efficient delivery of nutraceutical with the help of nano-vehicles are explained. Moreover, the book also includes reviews on such topics as nanopharmaceuticals, health benefits and the toxic impact of heavy metal nanomaterials and the impact of several nanomaterials on plant abiotic stress and have focussed on the long term impacts of nanomaterials on agroecosystems. The reader will also find presentations on molecularly imprinted polymeric nanocomposites, critical and comparative comments on Nano-biosensors and Nano-aptasensors and on applications of nanotechnology for the remediation and purification of water with a main focus on drinking water. The last chapter presents a comprehensive review on plasmonic nanoparticle based sensors whereby the authors have hypothesized the future applications in the environment which can be plausible in the near future.

Synthesis Techniques for Polymer Nanocomposites Green Nanomaterials for Industrial Applications explores the applications of nanomaterials for a variety of industry sectors, along with their environmental impacts, lifecycle analysis, safety and sustainability. This book brings together the industrial applications of nanomaterials, covering new trends and challenges. Significant properties, safety and sustainability and environmental impacts of synthesis routes are also explored, as are major industrial applications, including agriculture, medicine, communications, construction, energy, and in the military. This book is an important information source for those in research and development who want to gain a greater understanding of how nanotechnology is being used to create cheaper, more efficient products. Green nanomaterials have significant advantages including low cost, high efficiency, neutral environmental impact, and stability. Green Nanomaterials for Industrial Applications provides comprehensive information about green nanomaterials, their types, and methods for generation, characterization as well as their properties. Furthermore, this book also provides coverage of industrial scale fabrication methods for green nanomaterials and their applications for various industrial sectors at both experimental and theoretical models scales. This book is an important reference source for materials scientists, engineers and environmental scientists who want to learn more about how sustainable nanomaterials are being used in a range of industrial applications. Explores industrial scale fabrication of green nanomaterials Assesses environmental, legal, health and safety aspects Discusses how green nanomaterials can be manufactured on an industrial scale

Green Synthesis in Nanomedicine and Human Health Green synthesis is an emerging method for deriving nanoparticles present in natural plants for use in nanomedicine. Written by experts in the field, Green Synthesis in Nanomedicine and Human Health showcases the exciting developments of this specialty and its potential for promoting human health and well-being. This book gives practical information on novel preparation methods for identifying nanoparticles present in natural plants. It discusses applications of nanoparticles in combating communicable, non-communicable and vector-borne diseases. It also explores the potential for nanoparticles to combat antimicrobial resistance through improvements in treatment methods, diagnostics and drug delivery systems. Features scientific evidence of opportunities for integrating indigenous flora into nanomedicine to develop cost-effective therapeutic and diagnostic solutions for diseases, including cancer, tuberculosis, malaria and diabetes. Places green synthesis and nanomedicine in the African orthodox and traditional healthcare context. Provides policymakers with scientific evidence to inform policies for controlling or mitigating dangerous diseases. This book is essential reading for students, scientists, policymakers and practitioners of nanotechnology, and will appeal to anyone with an interest in integrating traditional African healthcare and Western medicine.

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